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Impact of Special Economic Zones on the Domestic Market: Evidence from Russia

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Prague, Czech Republic Evgeniya Dubinina

July, 21

Declaration

1. I hereby declare that I have compiled this thesis using the listed literature and resources only.

2. I hereby declare that my thesis has not been used to gain any other academic title.

3. I fully agree to my work being used for study and scientific purposes.

In Prague on Evgeniya Dubinina

Abstract

Place-based policies can be an effective instrument for governments to encourage the economic development of a country. A Special Economic Zone (SEZ) is a place-based policy aimed at attracting FDI, employment growth, and supporting new economic reforms. In addition, an SEZ is a potential catalyst for development, particularly for emerging economies (Alder et al., 2016; Grant, 2017); foreign investors can have a drastic impact on the productivity of domestic firms, revenues, and market shares through the implementation of new technologies and the creation of new firms. However, the effects of SEZs on the domestic market at the firm level are largely understudied. In this thesis, I leverage the large-scale SEZ policy implemented by the Russian government in 2005 that aims to attract foreign investors to specific parts of the country by offering tax relief. The primary objective of this thesis is to quantify the effects of the Russian SEZ policy on local firms. To examine the effects, I use the generalized Difference-in-Difference methodology and apply it to a panel of firms in Russia for the 2006-2015 period. The data includes time-varying SEZ treatment on firms, firm characteristics, and accounting data. The primary outcome variables of interest are revenues, profits, and total factor productivity. The research findings could contribute to the urban economic literature on place-based policies and may be helpful to policymakers in determining the effectiveness of SEZ place-based policies.

Abstrakt

Oblastně-specifická politika může být efektivním nástrojem vlád ke stimulaci ekonomického rozvoje země. Speciální ekonomická zóna je oblastně-specifická politika zaměřená na přilákání přímých zahraničních investic, podporu zaměstnanosti a zavádění nových ekonomických reforem v konkrétním regionu. Speciální ekonomické zóny jsou zároveň potenciálním katalyzátorem rozvoje obzvláště méně rozvinutých ekonomik (Alder et al., 2016; Grant, 2017). Zahraniční investice mohou mít dramatický dopad na produktivitu domácích firem, výnosy, tržní podíly skrze implementaci nových technologii a vytváření nových firem. Vliv speciálních ekonomických zón na domácí trh na úrovni firem je dosud velmi málo prozkoumán. V této práci využívám rozsáhlou implementaci speciálních ekonomických zón v Rusku v roce 2005, která měla za cíl přilákat zahraniční investory do konkrétních částí země skrze daňové úlevy. Primárním cílem práce bylo kvantifikovat efekt ruských speciálních ekonomických zón na lokální firmy. K prozkoumání vlivu využívám zobecněný odhad difference-in-difference a aplikuji jej na panelová data firem v Rusku za období 2006 až 2015. Data zahrnují v čase proměnlivé speciální ekonomické zóny, charakteristiky firem a účetní data. Primární zkoumanou výstupní proměnnou jsou výnosy, zisky a celkové faktory produktivity. Svými výsledky přispívám do ekonomické literatury oblastně-specifické politiky. Výsledky mohou být nápomocné tvůrcům hospodářské politiky při určení efektivity speciálních ekonomických zón.

1 Introduction [1]

Governments usually attract FDI by implementing tax deductions for foreign investors and stimulating policies on a federal or regional level. Special Economic Zones (SEZs) have been established in India, China, Sub-Saharan African countries, Poland, and other countries. SEZ policy demands substantial government expenditures on infrastructure, developing institutions, and providing incentives for investors. Thus, an effective SEZ policy is vital for the whole economy (Cizkowicz et al., 2015). SEZs can have a drastic impact on the productivity of the domestic market, revenues, and market shares of firms through the implementation of new technologies and the creation of new firms. Foreign firms, on average, are more productive than domestic firms (Ebenstein, 2012). Thus, their presence induces productivity growth in the domestic market. On the one hand, domestic firms could benefit from research and development (R&D) spillovers from foreign firms and the growth of productivity. On the other hand, the revenues of domestic firms after policy implementation could decrease because of higher market competition and lower market share. Therefore, the weakest firms could be forced to leave the market. Nevertheless, the strongest firms could survive, have growth productivity and profit growth.

In this thesis, I estimate the direct effects of SEZs on the revenues and factor productivity of domestic firms by using the generalized Difference-in-Difference (DID) technique, which could shed more light on the domestic market changes after SEZ policy implementation. I use panel data from 2006 to 2019 collected from publicly available sources including the Federal State Statistics Service of Russia,[2] the Federal Tax Service of Russia,[3] and the Russian Special Economic Zones website,[4] as well as from a commercial source, Spark Interfax.[5] The data includes time-varying SEZ treatment on firms, firms' characteristics, and accounting data. Different years of firms'

[1] Parts of this paper were submitted to the Research Writing II course at CERGE-EI, Fall 2020 and Microeconometrics course at CERGE-EI, Spring 2021.
[2] Federal State Statistics Service of Russia. Open data. https://rosstat.gov.ru/opendata (accessed December 4, 2020).
[3] Federal Tax Service of Russia. Open data. https://www.nalog.ru/opendata/?n=&od=&by= (accessed December 4, 2020).
[4] Russian Special Economic Zones. http://eng.russez.ru/ (accessed December 1, 2020).
[5] International information group SPARK. https://www.spark-interfax.ru/ (accessed December 4, 2020).

participation in the SEZ policy provide an exogenous variation for causal inference. Specifically, in the same region and industry, there are firms that are residents of the SEZ (the area inside the region) and non-residents after SEZ policy implementation. The primary outcome variables of interest are revenues and total factor productivity. In the sample, I have 12 regions affected by the SEZ policy and 177 business activities (each activity belongs to the particular code of the Russian Classifier of Types of Economic Activity) treated by the SEZ policy. The research findings may contribute to the urban economic literature on place-based policies and can be helpful to policymakers in Russia and other countries in creating or changing SEZ policy.

The research findings of my paper show a significant and positive effect of SEZ policy implementation in Russia on firm productivity and firm revenues in the domestic market. The results are robust to including one and three leads and lags, control variables (logarithm of capital and logarithm of labor), and fixed effects for firms, regions, business activities, and time. The parallel trend assumption holds for one lead and lag specification of the model and three lead and lag specifications of the model.

In 2005, the Russian government started creating SEZs to attract foreign investors with special incentives: customs-free zone, corporate tax rate deduction, and exemption from land and transport taxes from 5 to 15 years.[6] By 2020, twenty-seven SEZs had been created in eighteen Russian regions with different specializations: industrial (15 zones), technological (6 zones), touristic and recreational (5 zones), and logistic (1 zone). SEZs are located mostly in the central and western parts of Russia.

Figure 1 presents a map of SEZs in Russia: purple are industrial zones, green are technological zones, blue are touristic and recreational zones, brown are logistic zones and red are areas that have at the same time industrial and technological zones. The map shows that touristic and recreational zones are located near the borders and sea or lakes: zones in the south of the country are located near Lake Baikal and zones in the south-western part are located near the Black Sea and the Caspian Sea. Industrial zones are located mainly in the European part of the country. The logistic zone in Ulyanovsk Oblast, which was established in 2009, located near the Volga River, which is the longest river in Europe. However, not all the zones have residents now, because

[6] Russian Special Economic Zones. http://eng.russez.ru/ (accessed December 1, 2020).

some of them established recently (e.g. in from 2018 to 2020, 8 SEZs were established). In Russia, the first step of SEZ policy implementation consisted of creating 5 zones with 2 specializations in 2005 (2 in the industrial cluster and 3 in the technological cluster). Subsequently, from 2006 until 2010, 6 zones with 2 specializations were created (2 in the industrial cluster, 4 in the touristic and recreational cluster, and 1 in the logistic cluster), and during the 2011-2020 period, 17 zones with 3 specializations were established (13 in the industrial cluster, 3 in the technological cluster, and 1 in the touristic and recreational cluster). Figure 4 in the Annex presents a map of SEZs in Russia with a non-zero number of residents. By 2020, there were 27 SEZs in Russia, 21 of which have non-zero residents. In comparison with other countries (China, India, Poland, African countries, and other countries), for SEZ policy in Russia is a recent reform and there is no previous experience similar to SEZs.

The effects of SEZs on the domestic market in Russia are largely understudied. A thorough review of the literature reveals that only one paper study the effects of SEZs in Russia: Frick et al. (2018) estimate the effect of different factors on the economic growth of an individual SEZ in 22 emerging countries, including Russia. The sample consists of 346 zones for the 2007-2012 period. The authors use nightlights as a proxy for the economic growth outcome because of limited data availability. From the data analysis, the authors find that the average growth of SEZs in Russia is faster than the national growth for the period of 2007-2012. However, the SEZ area grows slower than the surrounding area in Russia. However, to my knowledge, the effects of SEZ policy on productivity and revenues have not yet been studied on firm-level data.

The current literature shows mixed effects from SEZs on the productivity of the domestic market: Abraham et al. (2010), Ito et al. (2010), Wang (2013), Alder et al. (2016), Lu et al. (2019), Zhaoying (2021) show a positive spillover effect on productivity for the domestic market. In contrast, Lin et al. (2009) find no effect, while Hu and Jefferson (2002) find a negative effect. However, the sign of the effect could depend on the quality of institutions, infrastructure, government monitoring and evaluating instruments of SEZ policy (Farole, 2010). Moreover, the initial number of SEZs could impact SEZ performance. According to Zeng (2016), Sub-Saharan African countries with 10 or 20 zones, in the beginning, received worse effects for the domestic economy in comparison with SEZs in China that had 4 zones at the beginning.

Figure 1. SEZs in Russia.

Source: Created by author with https://mapchart.net/russia.html

To choose the causal relation of SEZ treatment on firm earnings and total factor productivity, I use the instrumental variable approach. I construct the instrument from the multiplication of two variables: the SEZ industry share in the overall gross regional product in 2000 and the growth rate of the same industry at the country level (time-varying components of the instrument). My instrument is based on the hypothesis that SEZ location should be connected with agglomeration clusters or dominant industries in the regions. Further, the SEZ location should be connected with regions where the particular industry dominates at the country level. However, the exclusion restriction requires that the instrument variable should not be connected directly with the outcome variable. The exclusion restriction should hold because firms do not have the direct impact of industries at the country and regional levels on earnings. Moreover, the instrument variable and outcome variable describe different periods, and the data for the instrument is based on a different level of the data. Thus, the relevance should also hold. However, my research findings show that the hypothesis of SEZs' strategic location the does not hold. Thus, the endogeneity problem of firm SEZ treatment could persist in the research. Previous studies show a strong causal link between SEZ policy implementation and TFP growth (Abraham et al. 2010; Ito

et al. 2010; Wang 2013; Alder et al. 2016; Lu et al. 2019; Zhaoying 2021) on a different institutional and infrastructure environment. Thus, the causal link is beyond doubt. For future research, to determine the causal relationship between SEZ treatment on firm earnings and total factor productivity, the proximity to important specialization centers for each type of SEZ could be used as an instrument, e.g. proximity to large rivers and transport logistic centers for logistic zones; the proximity to the leading research centers for technological zones; proximity to seas and popular mountains for touristic and recreational zones; and proximity to large consumer markets for industrial zones. According to Frick et al. (2018), proximity to these specialization centers impact the SEZ location decision. However, proximity to these specialization centers could not directly impact firm earnings and total factor productivity. Thus, the exclusion restriction and relevance condition should hold.

Further analysis of the SEZ effects on the domestic market in Russia could consider the spatial proximity of firms to SEZs, because the SEZ neighboring regions could benefit more from technological spillovers in the same industry. Moreover, the productivity changes after SEZ policy implementation could be studied in formal and informal sectors separately in Russia, because the marginal firm in the informal sector is smaller than in the formal sector (Paula and Scheinkman, 2010). In addition, as informal firms do not have access to credit and to the legal protection provided by the state, they cannot increase productivity (Paula and Scheinkman, 2010). Thus, the formal sector could benefit more from SEZ policy in the same sector. However, for such a study, more detailed data on Russian firms is needed.

2 Review of Relevant Literature, Background, and Case Studies

SEZs are areas where a government chooses to have different rules from the rest of the country (Moberg, 2018). The creation of SEZs is a popular policy instrument for attracting FDI implemented in countries such as China, Poland,[7] India[8] and others. The first SEZ was established in Ireland in 1959. The SEZ in Ireland was created as a combination of an industrial park and integrated investment, industry, and trade development instrument. According to Farole (2010), the Irish SEZ for investors included a special customs and investment incentives regimes, administrative support for investors, a developed infrastructure, and proximity to a major transport center. The Irish SEZ was an industrial enclave with an intertrade of capital, commodities, and labor with the neighboring economies (Farole, 2010). Subsequently, SEZs were established in East Asian and Latin American regions (Zeng, 2016). The main objectives of SEZs are attracting FDI, decreasing unemployment through the creation of new jobs with foreign employers, supporting new economic reforms, and acting as laboratories for new policy experiments (Zeng, 2016). In addition, SEZs are a potential catalyst for development, especially for emerging economies (Alder et al., 2016; Grant, 2017).

Empirical studies that address the role of SEZs in attracting FDI focus on comparing zone locations (Dorozynski et al., 2018) at regional or municipal levels (Wang, 2013) and the success of zones in terms of their characteristics (size of the zone, infrastructure, business environment, etc.), ignoring the influence of these SEZs on domestic firms. Dorozynski et al. (2018) show the overall growth of the economy after creating SEZs and emphasize the major role of investors in SEZs (72% of new jobs, 50% of investment projects, 81% of investment stock), using the example of Poland. Zeng (2010) estimates the effect of SEZs in China on the whole economy and finds growth in new jobs (30 million, the relative growth is unknown), national GDP (22%), FDI (46%), and exports (60%). Moreover, the technological progress of early SEZ municipalities is 1.6

[7] Polish Investment and Trade Agency. https://www.paih.gov.pl/why_poland/investment_incentives/sez (accessed December 1, 2020).
[8] Special Economic Zones in India. http://www.sezindia.nic.in/ (accessed December 1, 2020).

percentage points greater than in later treated municipalities (Zeng, 2010). Other countries also experience economic growth from SEZs: in Dubai, the jobs increase by 13%. In Jordan, SEZs attract $18 billion investment and create 10,000 new jobs (relative growth is unknown). In Bangladesh, SEZs attract $2.6 billion (relative growth is unknown) in foreign investment and create 350,000 new jobs (Zeng, 2016).

Recent literature discusses the productivity effects on the domestic market from foreign firms after SEZ policy implementation. The productivity effects arise from the learning behavior of domestic firms from foreign ones, when firms outside SEZs become more efficient after foreign investment (Zeng, 2016). According to Zeng (2016), positive productive spillover effects could be in the form of new technology transfer or innovation, growth in economic productivity, increase in economic diversification, or welfare effects for the domestic population. Ebenstein (2012) estimates the effects of SEZs on local firms in the People's Republic of China for the 1951-2002 sample period using OLS and 2SLS. The primary outcome variables of the paper vary in timing within cities and include the amount of FDI, labor productivity and wage rates. The main assumption of the paper is that foreign firms are more productive on average than domestic firms (Ebenstein, 2012). Thus, their presence induces productivity growth in the domestic market. Ebenstein (2012) estimates the following model:

$$Y_{jt} = \alpha + \beta_1 SEZ_{jt} + \mu_j + \mu_t + \epsilon_{jt}$$

Where: j is a city; t is time (years); Y_{jt} is an outcome variable (FDI flows, number of domestic firms; value-added per employee of all firms; wages; profits) in a city j in year t; μ_j is city fixed effects; μ_t is a time fixed effects.

The author shows that FDI growth leads to average labor productivity increase after SEZ policy implementation. R&D spillovers from foreign firms imply productivity growth not only for domestic firms but also for the entire domestic market. Further, Ebenstein (2012) finds labor productivity growth from foreign managers after SEZ policy implementation. The main pitfalls of the paper by Ebenstein (2012) are endogeneity in OLS-estimates as SEZs were located in the coastal areas near capitalist economies that could benefit from a location without treatment, the

selection bias from estimating different firms and unobserved bias from changes in the economy over the long period of the sample (1951-2002).

However, empirical evidence of spillover effects from foreign technology on the domestic market is controversial. Abraham et al. (2010) find positive spillovers from foreign firms in their study of the influence of FDI on the performance of domestic firms and the impact of SEZs on Chinese firms. They include total factor productivity (TFP) as an outcome of changing firm ownership from domestic to foreign, a spillover measure and a dummy for SEZs. Abraham et al. (2010) use the OLS method to estimate the effects of SEZs on firm TFP, and cluster standard errors at the firm-level to take into account possible correlation. Additionally, Ito et al. (2010) report positive spillover effects on TFP of domestic firms within and across industries. Moreover, Du et al. (2011) also show positive spillover effects on TFP in vertical and horizontal linkages in the domestic market. Greenstone, Hornbeck, and Moretti (2010) show productivity growth after place-based policy implementation in the United States, but only in the same county of SEZ location. Wang (2013) compares the changes among municipalities that created SEZs, and the impact of SEZs on the whole economy and on the productivity of domestic firms in China using OLS. The author finds that SEZs increase the TFP of local firms and the earnings of local workers. In East Asian economies SEZs bring technology transfer from foreign firms to the domestic firms, e.g. in the Philippines, the skill level rises because of technological spillovers from foreign firms (Zeng, 2016). Kline and Moretti (2013) find a mixed effect from the place-based policy: gains from the policy are accompanied by losses in other parts of the country. In contrast, Lin et al. (2009) do not find any spillover effects on productivity from foreign firms, while Hu and Jefferson (2002) show negative spillover effects of R&D and technology transfer from foreign firms.

The sign of spillover effects from foreign firms could depend on the structure of the market. If most of the market consists of strong firms, the spillover effects will be positive and the opposite effect will occur in a market consisting of weakest firms. The strong domestic firms could benefit from foreign technologies and increase the production output per unit of the factor, capital or labor. The weakest firms might not be able to compete with foreign firms and exit the market. Moreover, the effects of the SEZ policy could depend on time or the conjecture of the market (Zeng, 2016).

According to Zeng (2016), strong government support, institutions, a strategic location, commercial viability, and willingness to address environmental concerns in SEZs could make the

SEZ policy experience successful. In Singapore, the Republic of Korea, and Malaysia, the requirements were satisfied before policy implementation, thus positively affecting the domestic firms in terms of productivity (Zeng, 2016). Moreover, for successful policy implementation and domestic production growth, a country should have the channels of technology and R&D transfers, e.g. business incubators, conferences, innovation platforms (online or offline), and talent-recruiting programs (Zeng, 2016). In India and Sub-Saharan African countries, SEZs are situated as separate zones from the main firm agglomeration from the same industry. The technology transfers between firms from agglomeration and SEZs could be challenging. Thus, government intervention in the form of business incubators, conferences, monitoring and evaluation of the SEZ performance could be applied to maintain technology transfer and SEZ policy success.

2.1 SEZs in China

In 1978, China implemented an SEZ policy. By 2006, SEZs numbered 1,658, covering all the provinces in China (Zhaoying, 2021). In contrast to Russia, SEZs in China were divided into national SEZs and provincial ones, depending on the conducted governance level. The main preferences for SEZs in China are tax exemptions, land use discounts, priorities for receiving loans, simplification of bureaucratic procedures, and property protection. In addition, SEZ residents receive a personal income tax deduction to attract skilled human capital. In Russia, to my knowledge, there is no similar benefit for SEZ residents. However, a personal tax deduction could be beneficial for attracting skilled labor in many countries, especially developing ones, to increase labor productivity inside and outside SEZs. Recent studies find positive productivity effects from SEZ policy for treated firms (inside SEZs) and cities hosting SEZs (Wang, 2013; Alder et al., 2016 Lu et al., 2019). Zhaoying (2021) studies the SEZ spillover effects on regional productivity, i.e. the productivity of neighboring regions using a panel dataset from 2004 to 2007 from the Annual Survey of Industrial Firms for manufacturing industries. Zhaoying (2021) estimates the following model:

$$y_{it} = \beta sez_{it} + Z_{it}\lambda + \delta \sum_{j=1}^{N} \omega_{ij}\, y_{ij} + \gamma \sum_{j=1}^{N} \omega_{ij}\, sez_{jt} + \sum_{j=1}^{N} \omega_{ij}\, Z_{jt}\theta + \alpha_i + \alpha_t + \epsilon_{it}$$

Where: $y_{it}$is a productivity of the firms outside zones for county i and year t in regions; sez_{it} is the presence of firms in SEZs for county i and year t; $Z_{it}$is a regional productivity variables; ω_{ij} is dummy with a set of normalized inverse distance within 150 kilometers or zero otherwise; α_i is county fixed effects; α_t is time fixed effects; ϵ_{it} is the error term.

Zhaoying (2021) finds positive SEZ spillover effects on regional productivity of local firms (4% growth with 10% increase in SEZ presence) and the productivity of the firms from neighboring regions (0.0507% growth with 1% increase in SEZ presence). However, the results of the paper could not be applied to Russian SEZs. The effect from SEZs is generated not only by the zone itself but also from neighboring zones, generating a synergetic SEZ effect, because the SEZ coverage in China is larger than in Russia and also SEZs have existed in China longer than in Russia (in China more than 40 years and in Russia only 15 years). In addition, the author considers the SEZ effects only in the manufacturing industries of China. However, in my thesis, I consider all industries affected by SEZs, and whereas Zhaoying (2021) considers the short-run effect from SEZs (from 2004 to 2007), I study the period from 2006 until 2019. For the Chinese economy, the period from 2004 to 2007 is almost 25 years of SEZ experience and in Russia, the period from 2006 to 2019 is the first experience of SEZs.

Using the DID technique on firm-level panel data, Jin (2019) studies spillover effects after SEZ policy implementation in China and whether the policy prevents direct competition with domestic firms. The author uses data from the Annual Survey of Industrial Firms in China from 1998 to 2007 and covers mining, production and supply of electricity, gas and water, and manufacturing industries. Jin (2019) estimates the following model:

$$y_{fidt} = \beta_1 SEZSP_{idt} + X'_{fit}\phi + \lambda_f + \lambda_t + \lambda_d + \lambda_i + \epsilon_{fidt}$$

Where: f is a firm; i is an industry; d is a district; t is a year; y_{fidt} is the productivity of each firm; $SEZSP_{idt}$ is a share of firm output in the SEZ among all firms in the same district, industry and year; X'_{fit} is a set of controls; λ_f, λ_t, λ_d, λ_i are fixed effects for firms, industries, districts and time, respectively. Jin (2019) also includes the instrument variable to strengthen identification strategy and decrease the potential bias in estimation results. The instrument is

presented by variations across industries after China's WTO accession, and compares SEZ-treatment firm performance with non-treated among industries before and after the end of 2001. The author claims that the relevance and exclusion restriction holds as firms inside the SEZ have greater flexibility in utilizing FDI.

Jin (2019) finds a negative net horizontal spillover SEZ effect on local non-zone firms in the same industry and year. In comparison with the paper by Zhaoying (2021), Jin (2019) includes the data from 1998 to 2007, covering the same period (2004 - 2007) and finds contradictory results. The main differences between papers are industries and estimation methods that could lead to these opposite results.

Wang (2013) quantifies the impact and mechanisms of SEZ programs on the Chinese municipal dataset from 1978 to 2008. In comparison with previous studies mentioned in this chapter, this paper covers the largest period of SEZ policy experience in China. The dataset allows the examination of SEZ effects on China's municipalities before, during, and after the implementation of the SEZ policy and comparison of the effects from SEZs established earlier and later. The author uses the DID technique, where earlier SEZ adopters are in the treatment group and later SEZ adopters are in the control group. The author uses a matching technique to reduce the selection bias. The outcome variables are FDI, domestic investment, TFP growth, and factor prices in each municipality of each province in a particular year. The author also includes the municipal fixed effects to capture time-invariant differences between municipalities' observed and unobserved characteristics (abilities and endowments) that might influence FDI performance. Wang (2013) uses a traditional approach to standard errors and clusters them by municipalities.

Wang (2013) finds a positive effect on investment from the SEZ policy. Specifically, SEZ establishment leads to a 6.9 percentage-point growth in FDI. In addition, SEZs generate agglomeration economies: the technological progress of earlier adopters increases by 1.6 percentage points in comparison with the control group. Moreover, the average wage increases by 8% in the treatment group, and the treatment group has higher investment and TFP growth in comparison with the control group. Several SEZs in one municipality generate synergetic effects: greater FDI attraction and agglomeration economies (Wang, 2013). The results are consistent with Zhaoying's (2021) study but contrary to the results of Jin (2019). The major difference of the studies is the definition of treatment and control groups: Wang studies a long period and defines

the treatment group as earlier adopters of the SEZ policy and the control group the later adopters, while Zhaoying (2021) and Jin (2019) study a shorter period and study treatment and control groups in the same period but not between periods at the county and firm level, respectively. The results of Wang (2013) could not be applied to the Russian case because the experience of SEZ policy in Russia is not as long as in China and we could not compare earlier and later adopters because of the absence of data.

Alder et al. (2016) study the effect of the establishment of SEZs on GDP in China using the DID technique. They use a panel of Chinese cities from 1988 to 2010 and exogenous variation in time and space of SEZ establishment to measure the effects. Moreover, the authors show the components of GDP effect according to the production function: capital, labor, and TFP. The treatment group consist of areas with SEZs and the control group without them. Alder et al. (2016) include city fixed effects and province-time fixed effects to absorb time-invariant heterogeneity and changes in the provincial price levels. SEZs were established in China non-randomly and this could lead to selection bias. The authors attempt to deal with the selection bias using a restriction of the sample. Specifically, the restricted sample includes cities with administrative selection of zones. Thus, the selection criterion is clear in comparison with other cities. However, still the selection bias could persist because the selection was not random. The authors find that provincial-based type of SEZs lead to an increase of 6% in the GDP level. In contrast, the government-based SEZs lead to 10% GDP growth. Moreover, SEZ has a positive effect on investment growth in physical capital, but there is no empirical evidence of TFP growth. The results are robust to the restriction of the sample due to non-random SEZ establishment and including the controls of population size and government spending. The results of the paper are based on the period of the second wave of SEZs in China, when the government could change the strategies, location decision, infrastructure and institutions after the first wave experience. My research concentrates on the first and the main experience of SEZs in Russia. Thus, the results could not be fully applied to the Russian case. Moreover, the research by Alder et al. (2016) is based on city-level panel data while my research is based on firm-level data and may shed more light on the effects on the domestic market after SEZ policy implementation.

According to Alder et al. (2016), China has six types of SEZs: comprehensive Special Economic Zone, Economic and Technological Development Zone, High-tech and Industrial Zone, Bonded Zones, Export Processing Zone, and Border Economic Cooperation Zones. These zones

have similar privileges for investors, e.g. tax and custom duty deductions, reduced the price for land use, flexibility in administrative procedures (contracts and financing). By contrast, Russia has only one type of SEZ with the same privileges for investors. In China, spillover effects from different type of zones could exist and the results of the study could not be applied to the Russian case.

A thorough review of the literature considering SEZ policy effects in China reveals that the research findings could not be applied to the Russian case for several reasons. First, China has different types of SEZs that could impact each other in spillover effects, while Russia has only one type. Second, previous research considering China mainly addresses the county or city level, whereas my research concentrates on firm-level effects from SEZ policy implementation. Third, China has extensive experience in SEZ policy implementation (since 1978) and the government could monitor, evaluate and correct the SEZ strategy to adjust the effects on firms, cities and the country. In Russia, however, the SEZ policy was established recently (since 2005) and the performance of SEZs could not be compared with the Chinese first wave of SEZs in the 1970s and 1980s because the composition of the market was different.

2.2 SEZs in Poland

Nazarczuk and Uminski (2018) claim that SEZ policy could lead to the relocation of businesses from outside of zones to inside, and in some cases SEZs could lead to an isolation effect of firms inside zones from outside, appearing in the absence of the cooperation with non-SEZ firms. At the firm level, SEZ policy affects firms' balance sheets by providing an extra competitive advantage and an income tax exemption for SEZ residents. Additionally, other privileges are offered to investors of SEZs in Poland, such as lower tariffs and reduced local taxes (Nazarczuk and Uminski, 2018).

In 1995, Poland introduced SEZs in areas with high unemployment rate and uncompetitive industries (Nazarczuk and Uminski, 2018). According to Pastusiak et al. (2018), the main objectives of SEZ establishment were: regional economic development, business development, employment growth, and improving infrastructure. By 2015, 14 SEZs operated in Poland and attracted 33% of total FDI inflows in 4 years. Poland has three types of SEZs: the original SEZs,

industrial and technological parks, and duty-free zones and warehouses (Cizkowicz et al., 2015). Nazarczuk and Uminski (2018) study the SEZ effect on export performance using firm-level governmental and survey research data of Poland. The firm is considered treated if it is located in an SEZ and non-treated if located outside an SEZ. The authors match the sample and receive an equal number of firms in the treatment and control group (155 firms in each group). Nazarczuk and Uminski (2018) use kernel-based propensity score matching to address the endogeneity problem and the DID technique to obtain the average treatment effect on the treated. The authors find a positive SEZ effect on export for the firm-level dataset. This effect evolves from productivity and foreign investment in capital growth. The results are robust for export intensity, export propensity, the scale of exports, and log of exports.

Employing a spatial modelling approach, Cizkowicz et al. (2015) also study SEZ policy effects on employment and investment using 379 counties (with 30,000 observations of firms in total) in Poland over the period from 2003 to 2012. Cizkowicz et al. (2015) consider the original SEZs in Poland of the three types (i.e., the original SEZs, industrial and technological parks, and duty-free zones and warehouses). The authors claim that the effects from SEZs may depend on initial economic conditions in the regions where SEZs are located.

Cizkowicz et al. (2015) find positive effects on employment in that SEZs lead to creating new jobs not only in the treated county but also in neighboring counties: per every 100 jobs in SEZs appear 72 jobs outside SEZs in the host county and 137 jobs in neighboring counties. In addition, the authors find a positive effect on investments, but the effect is weaker than on employment.

Pastusiak et al. (2018) study the SEZ effects on the whole economy in Poland using P. Warr's enclave model (1989). This model decomposes micro and macroeconomic factors of SEZ capital attraction to the economy. The model shows the effect of SEZ capital growth inside and outside the zone on the production:

$$N_p = (L_t w + M_t P_M + E_t P_E + R_t + T_t) \times S_F^* - (L_t w^* + M_t P_M^* + E_T P_E^* + B_t S_K^*) - A_t - K_t$$

Where: N_p are net benefits; L_t is employment in a year; w are wages paid; M_t is a set of raw materials used in a year; P_M is a price for this raw material; E_t are utilities used in year t; P_E is a price for the utilities; R_t are interest and principal repayments of domestic loans in a year; T_t are taxes paid in a year; S_F^* is a ratio of the social value of foreign exchange to the official exchange rate; w^* is a shadow price of labor; P_M^* is a shadow price of domestic raw materials; P_E^* is a shadow price of utilities; B_t is a domestic borrowing in a year; S_K^* is a ratio of the shadow price of capital to its market price; A_t are administrative costs of the SEZ in a year t; K_t is a capital cost of SEZ physical capital.

According to Pastusiak et al. (2018), with time-series data the model predicts the future cash flows, forecasting a financial surplus after SEZ policy implementation. To apply the model to the Polish SEZ case, the authors adjust some variables in the model, due to different economic conditions, but consistent with assumptions of the original model:

$$N_p = \left(R_{kw} + E_x + CIT + S_{k\,SSE} - I_{mp} - P_{publ} - I_{\mathrm{infr}} + W_{SSE}\right) - \\ - \left(R_{kw} + E_x + CIT^* + S_{k\,SSE} - I_{mp} - P_{publ} - I_{\mathrm{infr}} + W_{SSE}\right) \times S_F^*$$

Where: R_{kw} are annual remuneration costs; E_x is an export of enterprises in SEZ; CIT is an income taxes paid by companies in the SEZ; CIT^* are income taxes paid by firms in the economy without SEZs – they are identical to the taxes paid in the economy with SEZ, enlarged by public assistance; $S_{k\,SSE}$ is a value of sales of domestic production to the SEZ; I_{mp} is a value of import of SEZ enterprises; P_{publ} is public support offered by the state; I_{infr} is infrastructure investments incurred by municipalities, management of SEZ and media providers; W_{SSE} are performance results of the SEZ management companies; S_F^* is a shadow cost indicator. Pastusiak et al. (2018) find that SEZs are a source of positive financial surplus for the Polish economy. The main factors of SEZ effectiveness are salaries, export, and the purchase of means for production on the domestic market (Pastusiak et al., 2018).

Cieslik and Ryan (2005) study whether SEZs matter for investment decisions of Japanese multinationals, analyzing potential locations of their firms in Poland using a regional dataset from 1991 to 2001. At the time of writing their paper (2005), Japan was one of the most important

source country of FDI and Poland was the largest FDI recipient country in Central and Eastern Europe. Thus, the research was conducted with these two parties. The hypothesis of the study is that SEZ is an effective policy instrument to attract foreign investors to particular regions. The authors use the Poisson regression model because the nature of the outcome variable is discrete:

$$\Pr(y_i \mid x_i) = \frac{e^{-\lambda,i}\lambda^{yi}}{Y_i!}$$

$$\ln \lambda_i = \beta' x_i$$

Where: $y_i = 0, 1, 2, \ldots$ and stands for a measure of foreign expansion in the econometrical analysis, specifically, for the absolute number of Japanese firms observed in region i at time t; λ_i is assumed to be log-linearly dependent on the vector of explanatory variables x_i, where β is a parameter vector on exogenous variables. Poisson distribution has a key assumption of the equality of the first two moments, but this assumption in the paper could lead to overdispersion. Thus, Cieslik and Ryan (2005) use the negative binomial model that allows multiplicative heterogeneity in the conditional mean. The data was collected by authors from Toyo Keizai Inc.'s Japanese Overseas Investment and Regional Statistical Yearbook of Poland. The authors find in the baseline specification (with wage, GDP, education, roads, railways, area) that the SEZ dummy variable has a positive and significant impact on the outcome variable, meaning that SEZ policy is a successful instrument for attracting investors to the particular regions. However, the results are not robust to including other explanatory variables (the telecommunication infrastructure, seaports and international airports in the regions), the SEZ dummy variable remains positive but not significant. Including more explanatory variables makes the SEZ dummy variable insignificant. However, Cieslik and Ryan (2005) do not use the theoretical model to construct Japanese investors' decisions about locating firms, e.g. the gravity model based on gross regional product and distance to the capital or large world markets. Thus, the results could be adjusted with the strong theoretical background. Nevertheless, whether SEZs are more attractive for investors in comparison with non-SEZ areas is important as SEZ policy causes high costs for governments. As a result, further research could be conducted on the Russian case with the strong theoretical background to reveal SEZ attractiveness for foreign investors.

The research findings for SEZs in Poland could not be applied to the Russian case. First, SEZs in Poland were introduced in regions with serious economic problems, which is not the case in Russia. Second, the authors measure the effects on employment, investment, and export, whereas in my thesis, I estimate the effects on productivity and earnings of the firms. Third, the authors claim that the effects from SEZs could depend on pre-existing conditions; in the case of Poland and Russia, these conditions are different. However, the P. Warr model (1989) could be used for further research to examine the capital flows to Russian SEZs and the impact of production on the economy outside the zone, as was undertaken by Pastusiak et al. (2018) on Polish time series data. Firms' accounting data, as well as firms' export and import data from and to the SEZ could be used for Warr's enclave model, collected from SEZ management.

2.3 SEZs in India

In 2000, the Indian government replaced Export Processing Zones (EPZs) with SEZs because the previous instrument did not attract FDI and promote economic activity in the regions. The main difference between EPZs and SEZs is that the latter is an integrated zone with developed infrastructure and the former is the industrial enclave (Aggarwal, 2006). India also implemented an SEZ policy framework to satisfy the requirements of SEZ residents. The main objectives of the Indian SEZ policy are generating economic growth with FDI and domestic increase, export of goods and services growth, and growth of new work places (Hyan and Ravi, 2018). SEZ residents in India have an exemption from customs duties, central excise duties, and a wide range of taxes; they have tax holidays for 15 years and a 100% income tax exemption for 10 years (Aggarwal, 2006). For one year, Indian SEZs attracted 550 million dollars of investment, 0.5 billion dollars of FDI and created 119,800 new jobs. However, studying the observed economic evidence is insufficient for policy evaluation because we observe only absolute numbers without estimating the trends over time.

Thus, Hyan and Ravi (2018) study the effects of SEZ policy implementation in India on general economic activity using time and special variations of SEZ activity. By 2016, India had 221 SEZs, attracting foreign firms with tax exemptions, infrastructural benefits and regulatory concessions, and directly employing 1.4 million people. Therefore, the developed infrastructure could improve the observed SEZ economic performance. Hyan and Ravi (2018) find that SEZs

lead to the formal sector growth pf the economy, growth in the productivity of firms, investment and employment growth in the economy. Moreover, the growth of the formal sector in the economy leads to overall productivity growth in the economy (Hsieh and Klenow, 2009), which is consistent with the empirical framework of Paula and Scheinkman (2010), who claim that the marginal firm in the informal sector is smaller than in the formal sector. In addition, informal firms do not have access to credit and to the infrastructure of the legal protection provided by the state, and consequently they cannot increase productivity (Paula and Scheinkman, 2010). In a survey of informal firms, Fajnzylber et al. (2011) find that 75% of firms are too small to become formal due to the high costs of registration. However, studying the effects of SEZ policy in Russia on size changes of formal and informal sectors is not valuable now because the number of SEZs is much less than in India (27 compared to more than 221, respectively). In India, the allocation of SEZ policy among regions is not random. Hyan and Ravi (2018) use the government-regulated approval process for SEZs as an exogenous source variation to isolate the SEZ effect on the economy of Indian regions and the DID technique to estimate the SEZ effect. The authors claim that the exogenous variation allows them to overcome a possible violation of the pre-trends assumption for the DID technique. However, the government-regulated approval process could be non-random as the area for SEZ is selected non-randomly before applying for government approval. The treatment group consist of regions with at least one operating SEZ and the control group consist of regions without SEZs. The authors use nighttime lights as a proxy for analyzing the economic growth and production spillovers after SEZ policy implementation and the Annual Survey of Industries dataset (firm characteristics such as production and wages) to analyze the effects on firms. The sample consists of 251 notified SEZs, 133 of which being operational by 2014 for fourteen years (from 2000 to 2014) and covering 30,000 firms from 2000 to 2009. The authors estimate the following model:

$$y_{fidt} = \alpha_0 + \alpha_1 No.OperatingSEZs_{dt} + \alpha_2 No.NotifiedSEZs_{dt} + \beta_i + \gamma_d + \delta_t + \epsilon_{fidt}$$

Where: y_{fidt} is an outcome variable (logged values of production, average labor productivity defined as total production per worker, wages, employment and value of plant and machinery) of an average formal manufacturing firm f in industry i and district d at time t; $No.OperatingSEZs_{dt}$ is the total number of operational SEZs in district d at time t;

$No.NotifiedSEZs_{dt}$ is the number of notified but not yet operational SEZs in district d at time t. The authors cluster standard errors at the district level.

Hyan and Ravi (2018) find labor productivity growth in the manufacturing sector of treated districts (24% growth from 2005 and 2010), within-industry expansion in formal production (46%), employment (18%), and investment in plant and machinery (37%). The authors show labor average and marginal labor productivity growth by 1.8% and 1.2% after policy implementation and claim that total factor productivity growth is between 0.7% and 1.2% with a constant return to scale of the Cobb-Douglas production function. However, the results of the paper could not be applied to SEZs in Russia: SEZs in India may have been initiated by the general public in contrast to Russia, where the government establishes SEZs. Moreover, in India there is a minimum size requirement for SEZ (the requirement is much lower in comparison with China), whereas in Russia, to my knowledge, no minimal size requirement for SEZs exists. In India, the tax exemption for residents lasts 5 years, while in Russia it lasts from 5 to 15 years, depending on the particular SEZ and business activity. Indian SEZs tended to locate in urbanized areas and within already-existing industrial clusters (Hyan and Ravi, 2018), while Russian SEZs are not always located in urbanized areas or existing industrial clusters. Therefore, the growth of productivity after SEZ policy implementation could be lower in Russia. Moreover, Indian SEZs were established to replace EPZs, because they were inefficient, whereas in Russia, SEZs were established from scratch. Furthermore, empirical evidence regarding Indian SEZs is mixed: Chaurey (2016) does not find a positive effect from SEZ policy in India on state-level productivity.

2.4 SEZs in Africa

Newman and Page (2017) claim that in low-income countries, geographic proximity of firms and formed industrial clusters could be beneficial for firms in terms of transport costs reduction, shared inputs, productivity spillovers and, as a result, profit growth. Thus, spatial industrial policies could impact firm performance in the industrialization of low-income countries. In Africa, EPZs and SEZs were established in the late 1990s and early 2000s. SEZs in Africa are open to foreign and domestic investors (Brautigam et al., 2010). According to Newman and Page (2017), the majority of zones were established between 2000 and 2009 (38 zones in 14 countries). African EPZs and SEZs experienced rapid growth during the 2000-2004 period, but slower growth

in 2005. Most African SEZs, except Mauritius and the partial initial success of Kenya, Madagascar, and Lesotho, failed to attract significant investment, promote exports, and create sustainable employment relative to other countries and internal targets (Farole, 2010; Farole and Moberg, 2014). Farole (2010) introduces possible reasons for the failure of African SEZs: first, the environment is not attractive for investors in comparison with global alternatives; second, lack of basic infrastructure and SEZ regulation; third, insufficient strategic planning; and fourth, poor choice of location and poor internal coordination. Newman and Page (2017) study the SEZ policy in 27 African countries but without estimation. The authors consider SEZs and EPZs as the same zones in comparison with other studies (8 countries with SEZs, 5 countries with EPZs, and others with another type of special zone). Previous studies consider SEZs and EPZs, especially in China, as separate objects because their specializations are different. EPZs are usually established as export-oriented zones and are located near the largest foreign markets. Thus, the results for EPZs and SEZs could differ from the results only for SEZs in Africa. Newman and Page (2017) find that, in 2000, China's Ministry of Commerce agreed to develop six SEZs in Sub-Saharan Africa (in Ethiopia, Mauritius, 2 in Nigeria, and 2 in Zambia). The Chinese government provided grants to support the developers of African SEZs. The authors claim that it is too early to estimate the success of SEZs, but still the Chinese government could contribute their experience to African SEZ growth.

To my knowledge, SEZ effects have not yet been studied in Africa using econometric analysis. Analytical studies underline the poor performance of SEZs in African countries (Farole, 2010; Brautigam et al., 2010). The main reason for foreign investment in African SEZs by the Chinese government was connected with natural resources (minerals and fuels), low-cost labor in Africa, and trade in the manufacturing sector between countries (Brautigam et al., 2010). According to Brautigam et al. (2010), most African countries have a natural resource curse: they specialize in exporting raw materials. Moreover, firms in African countries are almost 20 percent less competitive than firms in other regions (Brautigam et al., 2010). African SEZs are concentrated on facilitating competitiveness, fostering export-oriented production, and promoting wider economic reforms. Brautigam et al. (2010) claim that poor administrative, infrastructure, management performance and strategic imperfections are the main pitfalls of SEZ policy performance in African countries. Foreign investment from the Chinese government could improve SEZ policy performance in Africa for reasons: first, SEZs in China have successful long-

term global experience and could share their expertise in planning, developing, and operating SEZs in African countries; second, the Chinese government is interested in the success of their African SEZs because their trade in the manufacturing sector and natural resources depends on African SEZ performance; third, generous financial and nonfinancial support from the Chinese government; and fourth, Chinese SEZs in Africa are managed by the private sector, which is more profit-motivated (Brautigam et al., 2010).

However, Farole and Moberg (2014) claim that "best practice" for SEZ development and management are impossible to replicate because SEZ problems are mainly connected with the political economy of SEZs. Moreover, the SEZ political economy depends on market conditions of the place of SEZ implementation. Farole and Moberg (2014) analyze African SEZs from the political economy side with governmental and individual participants' performance of SEZ policy implementation and operation support. The authors underline possible reasons for SEZ failure in Africa. Firstly, the misaligned incentives of policy makers and other officials (politicians use the privileges of SEZs for self-enrichment, as an access to cheap land and fiscal incentives). One example of this is government investment in physical capital rather than in intangible assets (business climate, legal framework, professional and effective execution) because the physical capital of SEZs is easier to show to the public as a sign of progress than intangible capital; another example is when the government attracts firms to SEZs without competitive potential and fulfilment of SEZ targets for investments and exports because of preference for measurable and short-term results. Secondly, unjustified expectations of investors with respect to SEZ infrastructure and the quality investment environment. Farole and Moberg (2014) claim that this occurred because of the lack of the coordination between people promoting export and investment and those responsible for fiscal matters. Thirdly, government officials face a lack of information about the key features of SEZs: the location, nature of production, strategies to attract investors and industry focus. Thus, many firms are allowed to shut down and reopen under another name in order to receive SEZ privileges.

According to Brautigam et al. (2010), African SEZs need to engage the host government in SEZ operation, build a strategic systematic plan for SEZ development, provide good-quality infrastructure for investors in SEZs, and ensure closer links of foreign investors with the domestic private sector to improve SEZ performance.

The analytical analysis of SEZ experience in Africa reveals several important aspects for SEZ success: quality of infrastructure and institutions could increase SEZ performance; the business climate is an important part of SEZ attractiveness; the SEZ experience of other countries could be not possible to replicate because of the different environment. Thus, Russian policy-makers could take into account the African experience of SEZ establishment. However, econometrical analysis is needed to maintain the results of the analytical analysis of SEZ experience in Africa.

2.5 Firm TFP Growth and Revenue

According to the Donor Committee for Enterprise Development (DCED) Report (n.d.), productivity growth could lead to a decrease in employment in the short run as new technologies reduce the need for labor. In addition, productivity growth should lead to revenue and profit growth as less input is needed to produce the same amount of output and fewer costs, respectively. Using the example of Australia's largest telecommunication firm Telstra, Lawrence et al. (2006) study the contribution of productivity changes, price changes, and growth in firm size to firm profit growth. Given that the telecommunication industry is subject to rapid technological changes, this example could show empirical evidence for the effects of productivity growth on firm profits. Lawrence et al. (2006) underline that improvements in productivity, i.e., more output is produced from a given quantity of inputs, lead to more revenue and more profits. The authors find that changes in output prices, adjusting all the parameters, lead to, on average, an 8% decrease in revenue; labor price changes lead to, on average, a 1.7% decrease in revenue; and productivity growth leads to, on average, 19.8% growth in firm revenue.

Maziotis et al. (2012) study the impact of TFP on profitability growth as a function of production and price performance using panel data from water and sewerage companies in England and Wales for the 1991-2008 period. The research allows decomposition of the profit changes to productivity and price change contributions. Maziotis et al. (2012) find that for 11 years (1991 - 2008), average economic profitability increased by 5.9%, which was connected with TFP growth (22.9%) and price changes (13.9%). However, during 1991 and 2008, TFP had stable growth in

comparison with price changes, which had a growth until 1994 and during 1999-2000. Consequently, improvement in TFP or productivity growth positively impact the profits of firms. Indeed, productivity growth has a higher effect on profits than price changes.

Although price changes after SEZ policy implementation are outside the scope of my analysis, I do consider the impact of SEZ policy implementation on TFP growth and revenue growth. The empirical evidence suggests positive effects of SEZ policy implementation on TFP and revenues due to TFP growth.

2.6 Factors Affecting SEZ Effects

SEZ policy is an effective instrument for FDI attraction and productivity growth for the economy. However, SEZ policy effects could differ for low- and middle-income economies. The low-income economies could have a poor level of institutions, infrastructure, government monitoring and evaluating instruments. According to Farole (2010), the performance of SEZs in Sub-Saharan African countries (Ghana, Kenya, Lesotho, Nigeria, Senegal, Tanzania) was worse than in non-African countries (the Dominican Republic, Honduras, Vietnam, Bangladesh). For example, the average time needed for imports through major seaport to customs clearance in days in zones compared to the non-zone area improved in -0.33 days in Sub-Saharan African countries (the average effect for Ghana, Kenya, Lesotho, Nigeria, Senegal, Tanzania) and -7.5 days in non-African countries (the average effect for Bangladesh, the Dominican Republic, Honduras, Vietnam), respectively. Thus, problematic legal, regulatory and institutional frameworks, poor business environment, strategic planning, and adoption of demand-driven approaches to business should be improved to increase the probability of SEZ policy implementation success (Zeng, 2016). In the Republic of Korea, Malaysia, Jamaica, Jordan, and other countries, legal and regulatory institutions were improved before SEZ creation and this could positively impact SEZ performance.

The initial number of zones could impact the effect of SEZs on the domestic market. China started from four zones in different locations, and some Sub-Saharan African countries had 10 or 20 zones at the beginning (Zeng, 2016). In Russia, the first step of SEZ policy implementation

resulted in the creation of 5 zones with 2 specializations in 2005 (2 in the industrial cluster and 3 in the technological cluster). Subsequently, from 2006 until 2010 6 zones with 2 specializations were created (2 in the industrial cluster, 4 in the touristic and recreational cluster, and 1 in the logistic cluster), and during the 2011-2020 period, 17 zones with 3 specializations were established (13 in the industrial cluster, 3 in the technological cluster, and 1 in the touristic and recreational cluster). The gradual policy implementation gave additional time for the government to monitor and evaluate the effects of the policy, and to correct the policy if needed.

Cost-benefit analysis before SEZ policy implementation is a crucial step to assist the government in making the final decision. Moberg (2018) claims that cost-benefit analysis is difficult to compute because it will be based on quantitative approximations, excluding technological transfers from foreign to domestic economic agents. Benefits could be calculated from company profits and wages and costs could include resources used in the zone (based on prices and wage levels in the country). Moreover, Moberg (2018) underlines that the main benefits and costs are more political than economic, because the decisions made by investors, domestic firms and government are motivated by their own incentives rather than by the whole economy. Thus, not only should a cost-benefit analysis be undertaken before policy implementation, but also the incentives of all parties connected with the SEZ should be recognized in order to construct possible outcomes of SEZ policy implementation.

The positive effects from SEZs could be closely related to the business climate: removing obstacles to business operations, providing tax or duty incentives, and streamlining institutions (Gebrewolde, 2019). In addition, firms without strong R&D capacity benefit from SEZ policy, particularly small firms, because they are more flexible and dynamic and could reconstruct the production process, management and strategies relatively rapidly in comparison with large firms. For small firms, it is easier to benefit from knowledge and technology spillovers in clusters (Gebrewolde, 2019).

According to Gebrewolde (2019), physical infrastructure also plays a crucial role in the success and effects from SEZ policy, especially housing, road, port, power, and telecom infrastructure. These infrastructure investments should also be planned in advance as part of the SEZ strategy because infrastructure not only impacts business performance and SEZ attractiveness for business, but also attracts a skilled workforce with a plausible working environment.

Frick et al. (2018) summarize the main factors influencing SEZ performance in emerging countries based on current studies:

1) SEZ Program

- Incentives package (fiscal and nonfiscal) for firms to attract them to the SEZ. Fiscal incentives could be presented by exemptions and reductions from taxes and duties on a corporate or local level. Nonfiscal incentives could be presented in the form of one-stop-shops bureaucratic and administrative services (one organized point where the firm could solve all administrative and bureaucratic questions);
- Requirements (investment and ownership requirements). Certain programs inside the countries have low barriers of investment and employment to become an SEZ resident and receive SEZ privileges. Some SEZs are established to attract FDI, but it could be the case that domestic investors move their capital to an SEZ to receive SEZ privileges for investors, and thus the main aim of attracting foreign capital will not be achieved;
- Program characteristics. An independent zone regulator could facilitate efficient SEZ policy development and implementation;

2) SEZ characteristics

- General zone characteristics (the age of the zone, size, and industrial focus of the zone). The industrial focus allows investors to understand where industrial agglomerations exist or are expected to exist. Further, zone location could define industry focus, e.g. in Russia, SEZs located near Lake Baikal, the Black Sea and the Caspian Sea are focused on a recreational and touristic direction, whereas SEZs located near the largest regions of Russia with the most significant consumer markets, i.e., Moscow city, Moscow region, Leningrad Oblast, and Saint-Petersburg, have an industrial focus;
- Zone location (distance to major economic centers). The strategic location close to ports, consumer markets, and labor markets are key factors that investors consider when deciding on SEZ participation;

- Services and infrastructure (electricity, power supply, water supply, catering, parking, etc.). The infrastructure and supporting services as one-stop-shop facilities could highly impact investors' decisions;

3) Contextual Factors

- National and regional market conditions: institutional quality, access and proximity to markets, the level of industrialization, welfare of the country and the region, and labor markets. SEZs could be affected by socioeconomic characteristics of employees, population, and customers, market potential, and the general business climate in the country and region where the SEZ is located.

Frick et al. (2018) estimate the effect of these factors on the economic growth of an individual SEZ in 22 emerging countries[9] across 346 zones from 2007 to 2012, including Russia. Due to the limited data availability, the authors use nightlights as a proxy for the economic growth outcome from the Defense Meteorological Satellite Program for the years 1992-2012. The authors claim that the nightlight data could be a good proxy for firm creation in SEZs and employment as this data represents the average luminosity created by human activity. As the nightlight technology could differ among countries, the authors do robustness checks with the growth rates of the nightlights. More than half of the sample (52%) consists of SEZs established since 2000, one-third of the sample consist of SEZs established in the 1990s, and the other before 1990. From the data analysis, the authors find that the average growth of SEZs in Russia is faster than the national growth for the years 2007-2012. In Kenya, Turkey, and Ghana, SEZ growth is lower than the national growth (Frick et al., 2018). However, the SEZ area grows slower than the surrounding area in Russia.

The results of estimation using OLSs indicate a positive significant effect of SEZ size, distance to largest cities from SEZs, proximity to large markets, and the percent of SEZ industry in GDP of the country on SEZ growth. The authors find negative significant effects of SEZ years of operation and foreign ownership requirement on SEZ growth. They find no significant effect of subsidized utilities in SEZs, national one-stop-shop, independence of zone regulator, and rule of

[9] China, Philippines, Malaysia, South Korea, Thailand, Vietnam, Turkey, Russia, Ghana, Jordan, Kenya, Lesotho, Nigeria, South Africa, Argentina, Chile, Colombia, Dominican Republic, Honduras, Bangladesh, India, and Pakistan

law in SEZs on SEZ growth. The SEZ high-tech focus and corporate tax exemption have a negative and significant but not robust effect on SEZ growth (Frick et al., 2018). However, the authors emphasize that the estimation results may not capture the effect of mature zones when they upgrade technologically and move to higher value-added production.

Frick et al. (2018) find that zone growth is difficult to sustain over time, context significantly determines SEZ performance, proximity to large markets as well as preexisting industrialization also increase SEZ performance, and zone size matters, because larger zones have an advantage in terms of growth potential. The authors conclude that SEZs cannot be considered a growth catalyst in emerging countries because their economic dynamism does not exceed that of the countries where they are located; only zones with access to the largest cities in the country and to the main developed markets of the world can have economic dynamism. Most SEZs in Russia are located near the largest cities of Moscow and Saint-Petersburg, and the main developed markets in Europe and Asia. Thus, SEZs could display high economic dynamism as was shown by Frick et al. (2018). According to an DCED Report (n.d.), productivity growth allows firms to produce greater output for the same level of input, earn higher revenues and generating higher GDP. SEZs and accompanied productivity growth could lead to the economic growth of the whole economy.

Studies of SEZs usually consider the direct and spillover effects of SEZs on domestic firms and the domestic market of China, India, and Poland using different estimation methods, such as OLS and DID with panel data and time-series data. However, the research findings cannot be applied to SEZ policy effects in Russia, because the environment is different. First, SEZs in Russia have existed since 2005, in China since 1978, and India since 2000. In China, the government could adjust the performance and effects from SEZs after its longtime experience. In India, SEZs arose from EPZs that had industrial clusters before SEZ policy implementation. In Russia, SEZ policy was implemented without industrial clusters; the zones were established from scratch. Second, the research findings for productivity growth are mixed, depending on estimation strategy, the data, the infrastructure, institutions of countries, and the whole environment and business climate. Thus, Russian SEZs should be considered a separate case of SEZ effects. Moreover, to my knowledge, the effects of SEZs on the domestic market in Russia have not yet been studied. Only Frick et al. (2018) study SEZ growth including Russia and find that the average growth of SEZs in Russia is faster than the national growth for the years 2007-2012, but the SEZ area grows

slower than the surrounding area in Russia. In this thesis, I study the effects of creating SEZs on the revenue and productivity of the domestic market in Russia using the generalized Difference-in-Difference (DID) technique with panel data from 2006 to 2019. I collected data from publicly available sources of the Federal State Statistics Service of Russia,[10] the Federal Tax Service of Russia,[11] the Russian Special Economic Zones website,[12] and the commercial source Spark Interfax.[13]

[10] Federal State Statistics Service of Russia. Open data. https://rosstat.gov.ru/opendata (accessed December 4, 2020).
[11] Federal Tax Service of Russia. Open data. https://www.nalog.ru/opendata/?n=&od=&by= (accessed December 4, 2020).
[12] Russian Special Economic Zones. http://eng.russez.ru/ (accessed December 1, 2020).
[13] International information group SPARK. https://www.spark-interfax.ru/ (accessed December 4, 2020).

3 Data

I use panel data from 2006 to 2019, collected from the Federal State Statistics Service of Russia (FSSS),[14] the Federal Tax Service of Russia (FTS),[15] Russian Special Economic Zones website,[16] and Spark Interfax.[17] From the FSSS and FTS, I extracted firms' individual tax numbers (INN) to collect firms' characteristics and accounting data from Spark Interfax.[18] With the Russian SEZ website,[19] I obtained all information about SEZ participants, years of entering and exiting the SEZs. The data include time-varying SEZ treatment on firms, firms' characteristics (the region, the business activity), and accounting data. The primary outcome variables of interest are revenues and total factor productivity. The treatment group consist of firms that are located in SEZs and the control group consist of firms from the same industries as the treated firms but located outside SEZs in the same region and industry.

After collecting all the data for 2001-2019, it turns out that the data is highly unbalanced with many missing values. There were almost no data for the 2001-2005 period in the database; thus, this period was excluded from the study. In addition, I exclude Moscow city (as opposed to the region) as firms are different from this region compared to other regions. Moreover, Moscow has two SEZs with similar business activities of firms that could generate synergetic spillover effects in comparison with other regions. Additionally, I exclude regions with few firms or without firms (in these regions SEZs established recently and insufficient time has passed for firms to appear in these SEZs) in the SEZs and firms with outcome variable data availability of fewer than 8 years. In the sample, I have 12 regions,[20] 177 business activities (each activity belongs to the particular code of the Russian Classifier of Types of Economic Activity).

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[14] Federal State Statistics Service of Russia. Open data. https://rosstat.gov.ru/opendata (accessed December 4, 2020).
[15] Federal Tax Service of Russia. Open data. https://www.nalog.ru/opendata/?n=&od=&by= (accessed December 4, 2020).
[16] Russian Special Economic Zones. http://eng.russez.ru/ (accessed December 1, 2020).
[17] International information group SPARK. https://www.spark-interfax.ru/ (accessed December 4, 2020).
[18] International information group SPARK. https://www.spark-interfax.ru/ (accessed December 4, 2020).
[19] Russian Special Economic Zones. http://eng.russez.ru/ (accessed December 1, 2020).
[20] The Republic of Buryatia, the Republic of Tatarstan, Altai Krai, the Irkutsk Region, the Lipetsk Region, the Moscow Region, the Pskov Region, the Samara Region, the Sverdlovsk Region, the Tomsk Region, the Ulyanovsk Region, Saint-Petersburg (comparable to region)

4 Empirical Strategy

For the empirical strategy, I follow the approach of Granger (1969), and Angrist and Pischke (2009) to estimate the SEZ policy effects, when treatment starts at a different time for firms. I use a generalized Difference-in-Difference approach including lags (time before treatment) and leads (time after treatment) in the model:

$$Y_{it} = \alpha_i + \lambda_t + v_j + \gamma_r + \sum_{\tau=0}^{m} \delta_{-\tau} D_{i,t-\tau} + \sum_{\tau=0}^{q} \delta_{+\tau} D_{i,t+\tau} + X_{it}'\beta + \epsilon_{it}$$

Where: Y_{it} is an outcome variable (logarithm of earnings); α_i is firm fixed effects; λ_t is time-specific fixed effects; v_j is business activity fixed effects; γ_r is region-specific fixed effect; $D_{i,t}$ is a dummy variable for treatment (if a firm enters the SEZ it will be unity and zero otherwise), at $\tau = 0$ switches to treatment; δ_0 is the contemporaneous treatment effect; δ_{-1} is the medium-term effect; $\delta_{+\tau}$ if treatment in the future affects Y, now-reverse causality from the future to the past. I include fixed effects to take into account non-time varying differences in infrastructure and institutions among regions, non-time varying differences in internal business processes among firms, also non-time varying differences in the structure of business activities and time-varying differences to include other characteristics.

Variation in the year and industry of SEZ policy implementation yields exogenous variation for identifying a causal effect. Specifically, in the same region and industry there are firms that are residents of SEZ (the area inside the region) and non-residents after SEZ policy implementation. However, a firm could decide to be a resident of an SEZ subsequent to the year of SEZ establishment. The residents of an SEZ in Russia could be foreign investors or domestic. Figure 5 in the Annex presents the particular locations of firms on the Russian map.

In the next section, I discuss the estimation results of the linear regression model including leads and lags, fixed effects, and the controls. In all the specifications, I cluster standard errors at the level of region multiplied by business activity because, in the study design, treatment is also

clustered at the region and activity levels. I include two controls in the analysis: labor and capital of firms because other possible controls have many missing values. Initially in the database, the labor variable was an interval for labor force, e.g. 0-5, meaning that the firm has from 0 to 5 workers. For a higher number of workers, the interval could be from 100 to 150. However, as I do not have information about the precise number of workers in the firm, I smooth the differences of the intervals by calculating a new variable of labor:

$$Labor_{it} = \frac{\log Min_{it} + \log Max_{it}}{2}$$

Where Min_{it} is a minimum of the labor interval and Max_{it} is a maximum of the interval.

For capital, I also use the logarithmic form to be consistent with the linear form of the Cobb-Douglas production function:

$$F(K, L) = A\, K^{\alpha} L^{1-\alpha}$$

Where: A is technology parameter; K stands for capital; L is labor and α is the parameter of the return to scale. The initial value of capital is presented in rubles and stands for "equity capital" in the firms' accounting books. In the logarithmic form, the Cobb-Douglas production function has the following formula:

$$\log F(K, L) = \log A + \alpha \log K + (1 - \alpha) \log L$$

To identify the causal effect of SEZ treatment on firm earnings, I use the instrumental variable approach. This approach requires an exclusion restriction to hold: the instrument should not directly affect the outcome variable. At the same time, the instrument should be relevant so that the instrument variable should affect the SEZ treatment. I construct the instrument from the interaction of two variables: the SEZ industry share in the overall gross regional product in 2000

and the growth rate of the same industry at the country level. The multiplication of the instrument components gives the time-varying instrument variable. The data for the instrument variable was also collected from the Federal State Statistics Service of Russia.[21] The SEZ location should be connected with agglomeration clusters or dominant industries in the regions, as in the cases of SEZs in China and India. In addition, the SEZ location should be connected with regions where the particular industry dominates at the country level and the growth rate of the particular industry. However, the instrument variable should not be connected directly with the outcome variable because firms do not have the direct impact of the industries at the country or regional levels on the earnings. Thus, the relevance and exclusion restriction should hold. Moreover, the instrument variable and outcome variable describe different periods: the instrument variable is based on the industry share of gross regional product in 2000 and the outcome variable is based on 2006-2019 data. The time-varying part of the instrument is connected with the growth rate of the industries at the country level and the outcome variable is for firm-level data. Thus, the exclusion restriction should hold.

[21] Federal State Statistics Service of Russia. Open data. https://rosstat.gov.ru/opendata (accessed December 4, 2020).

5 Results

Table 1 presents the results of estimating the multi-way fixed effects model (without lags and leads). The outcome variable for all regressions, (1) - (6), is the logarithm of firm earnings. The explanatory variable for the regressions (1) - (3) is a dummy variable for the SEZ treatment. The regressions (1) - (3) differ in the fixed effects [(1) is without fixed effects; (2) is with firm, year, and region fixed effects; (3) is with all fixed effects]. The explanatory variable for the regressions (4) - (6) is the logarithm of labor and the logarithm of capital. Regressions (4) - (6) also differ in the fixed effects [(1) is without fixed effects; (2) is with firm, year, and region fixed effects; (3) is with all fixed effects]. The regressions with fixed effects [(2) - (3), (5) - (6), (8) - (9), (11) - (12)] absorb effects that are not changing over time for firms, business activities and regions, as well as effects that change over time (time fixed effects).

The treatment coefficient indicates a positive significant effect of creating SEZs on firm revenues in the baseline specification (1) and the specification with fixed effects [(2), (3)]. Moreover, the SEZ treatment coefficient remains positive and significant in the specifications with control variables [(7) – (9)]. However, including the interaction variables of SEZ and logarithm of labor and SEZ and logarithm of capital decrease the significance of the coefficient but leave it positive. The labor coefficient is significant and negative in all the specifications where it is included [(4) – (12)]. The sign of the coefficient could be connected with the form of marginal earnings for one unit of labor, where a firm could have enough labor and an additional unit of labor will decrease the earnings. Moreover, according to DCED Report (n.d.), growth of productivity could lead to a decrease in employment in the short run, as new technologies reduce the requirement for labor. The logarithm of capital is positive and significant in all specifications where it is included [(4) – (12)]. The sign of the capital coefficient is expected because, under constant return to scale, more input should lead to more output and more earnings. Table 1 Panel C presents the multi-way fixed effects model with labor factor productivity as an outcome variable, calculated as an earnings-to-capital ratio. Regressions (13) - (15) also differ in the fixed effects [(1) is without fixed effects; (2) is with firm, year, and region fixed effects; (3) is with all fixed effects]. The SEZ coefficient is significant and positive. Thus, the SEZ treatment leads to a growth of earnings per one unit of labor. However, the result contradicts the previous results in Table 1,

Panel A and B for the effect of labor productivity. A possible explanation for the result is the lack of control variables in this specification.

The results of positive TFP growth after SEZ policy implementation are shown in the papers by Ebenstein (2012), Abraham et al. (2010), Ito et al. (2010), and Du et al. (2011) in different countries that have established SEZs. Thus, my research findings are consistent with previous studies of SEZs in other countries. Zeng (2016) notes that the effects of an SEZ policy could depend on the time or conditions of the market. A positive sign of SEZ policy implementation in relation to the earnings of firms and productivity could indicate favorable conditions and environment for SEZ policy implementation, e.g. a strategic SEZ location, willingness to address environmental concerns in SEZs, and government support.

Table 2 presents estimation results, including one lead and one lag, and Figure 2 illustrates these estimation results graphically. Figure 2 has confidence intervals and coefficients from Table 2 with one lag and one lead, control variables and fixed effects. The vertical bands represent ± 1.96 times the standard error of each point estimate. The SEZ treatment starts on the horizontal line with zero. On the left side, before the treatment, we see that the coefficient is indistinguishable from zero, which is why the pre-trends assumption holds. The coefficient for the SEZ dummy variable is robust because it is still significant and positive in all specifications [(1) – (6) of Table 2]. The labor coefficient is negative and significant in the specifications where the control is included [(2) - (3), (5) - (6)]. As was mentioned before, the sign of the coefficient could be connected with the form of marginal earnings for one unit of labor, where a firm could have enough labor and an additional unit of labor will decrease the earnings. The coefficient for capital is significant and positive in all the specifications of the model where the coefficient is included [(3), (6)], and thus the coefficient is robust.

Table 1. Multi-way fixed effects model.

PANEL A	(1)	(2)	(3)	(4)	(5)	(6)
SEZ	2.841***	0.632***	0.632***			
	(0.273)	(0.142)	(0.142)			
Logarithm of labor				-0.301***	-0.028***	-0.028***
				(0.017)	(0.006)	(0.006)
Logarithm of capital				0.661***	0.344***	0.344***
				(0.015)	(0.012)	(0.012)
constant	15.473***	15.487***	15.487***	6.697***	10.167***	10.167***
	(0.050)	(0.001)	(0.001)	(0.374)	(0.220)	(0.220)
Number of observations	101,122	101,100	101,100	77,949	77,758	77,758
PANEL B	(7)	(8)	(9)	(10)	(11)	(12)
SEZ	1.795***	0.462**	0.462**	1.069	2.737*	2.737*
	(0.151)	(0.170)	(0.170)	(1.362)	(1.174)	(1.176)
Logarithm of labor	-0.296***	-0.028***	-0.028***	-0.300***	-0.030***	-0.030***
	(0.017)	(0.006)	(0.006)	(0.017)	(0.006)	(0.006)
Logarithm of capital	0.660***	0.344***	0.344***	0.660***	0.347***	0.347***
	(0.015)	(0.012)	(0.012)	(0.015)	(0.012)	(0.012)
SEZ x Logarithm of labor				0.297***	0.143***	0.143***
				(0.044)	(0.031)	(0.031)
SEZ x Logarithm of capital				-0.059	-0.177**	-0.177**
				(0.071)	(0.063)	(0.063)
constant	6.667***	10.163***	10.163***	6.686***	10.135***	10.135***
	(0.375)	(0.220)	(0.220)	(0.378)	(0.219)	(0.219)
Number of observations	77,949	77,758	77,758	77,949	77,758	77,758
PANEL C	(13)	(14)	(15)			
SEZ	3.298***	0.806**	0.806**			
	(0.271)	(0.250)	(0.251)			
constant	9.599***	9.615***	9.615***			
	(0.050)	(0.002)	(0.002)			
Number of observations	101,122	101,100	101,100			
Lags	No	No	No	No	No	No
Leads	No	No	No	No	No	No
Firm fixed effects	No	Yes	Yes	No	Yes	Yes
Year fixed effects	No	Yes	Yes	No	Yes	Yes
Region fixed effects	No	Yes	Yes	No	Yes	Yes
Business activity fixed effects	No	No	Yes	No	No	Yes

Notes: Standard errors in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors are clustered at the level of multiplication region and business activity. Dependent variable: logarithm of earnings [(1) - (12)]; logarithm of earnings-to-capital ratio [(13) – (15)].

Table 2. Multi-way fixed effects model with one lag and lead.

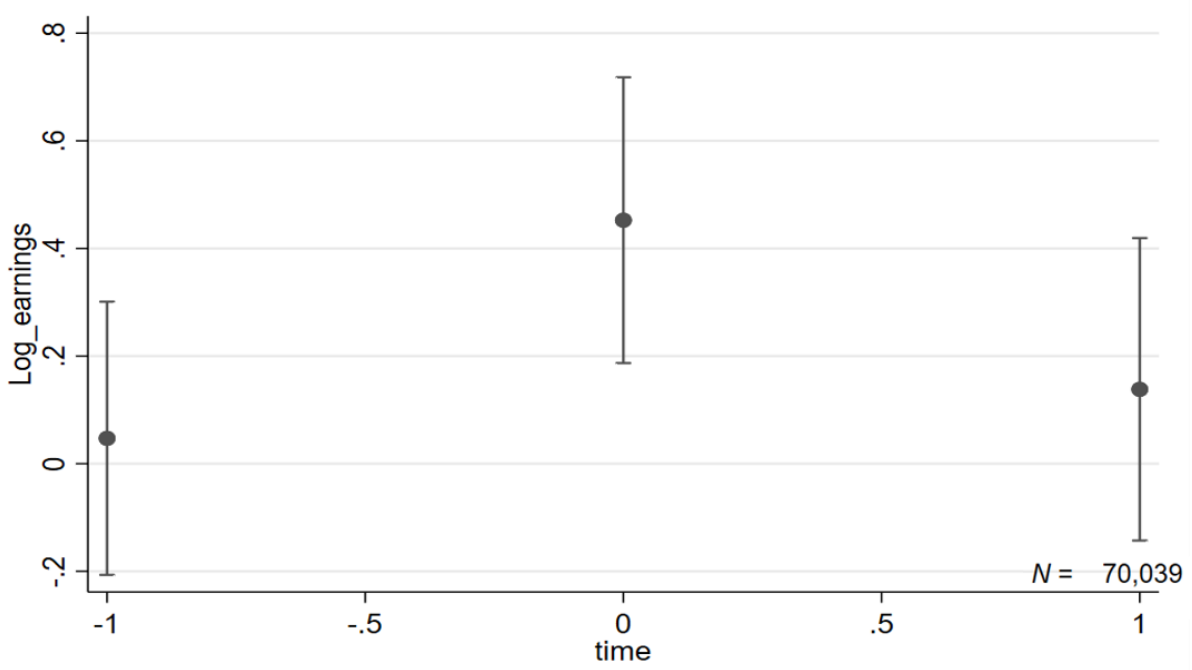
	(1)	(2)	(3)	(4)	(5)	(6)
SEZ	0.469***	0.452**	0.603***	0.469***	0.452**	0.603***
	(0.120)	(0.141)	(0.162)	(0.121)	(0.142)	(0.162)
Logarithm of labor		-0.053***	-0.032***		-0.053***	-0.032***
		(0.008)	(0.007)		(0.008)	(0.007)
Logarithm of capital			0.347***			0.347***
			(0.012)			(0.012)
Lag	Yes	Yes	Yes	Yes	Yes	Yes
Lead	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Business activity fixed effects	No	No	No	Yes	Yes	Yes
constant	15.451***	16.178***	10.057***	15.451***	16.178***	10.057***
	(0.001)	(0.056)	(0.220)	(0.001)	(0.056)	(0.221)
Number of observations	88,347	70,039	68,365	88,347	70,039	68,365

Notes: Standard errors in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors are clustered at the level of multiplication region and business activity. Dependent variable: logarithm of earnings

Granger (1969) and Angrist and Pischke (2009) suggest including at least three periods in lags and leads in the standard generalized DID. Thus, Table 3 presents the same specifications as in Table 2 but includes three leads and lags. Figure 3 presents the results of Table 3 graphically. The results are robust to including 3 leads and lags: the SEZ coefficient remains significant and positive in all specifications [(1) - (6)] of Table 3, the capital coefficient remains significant and

positive in all specifications where the variable is included [(3), (6)]. However, the labor coefficient loses significance in the specifications where all the control variables are included [(3), (6)]. Thus, the robustness of the coefficient is not stable and further research and data should be conducted to detect the robust sign of the coefficient. On the left side of the graph, from the treatment time zero in Figure 3, the coefficients are indistinguishable from zero. Thus, the pre-trends assumption holds.

Figure 2. Time passage relative to the year of the SEZ treatment.



Notes: In the graph, grey points are the point estimates; lines below and above point estimates are at the 95% confidence interval.

Table 3. Multi-way fixed effects model with three lags and lead.

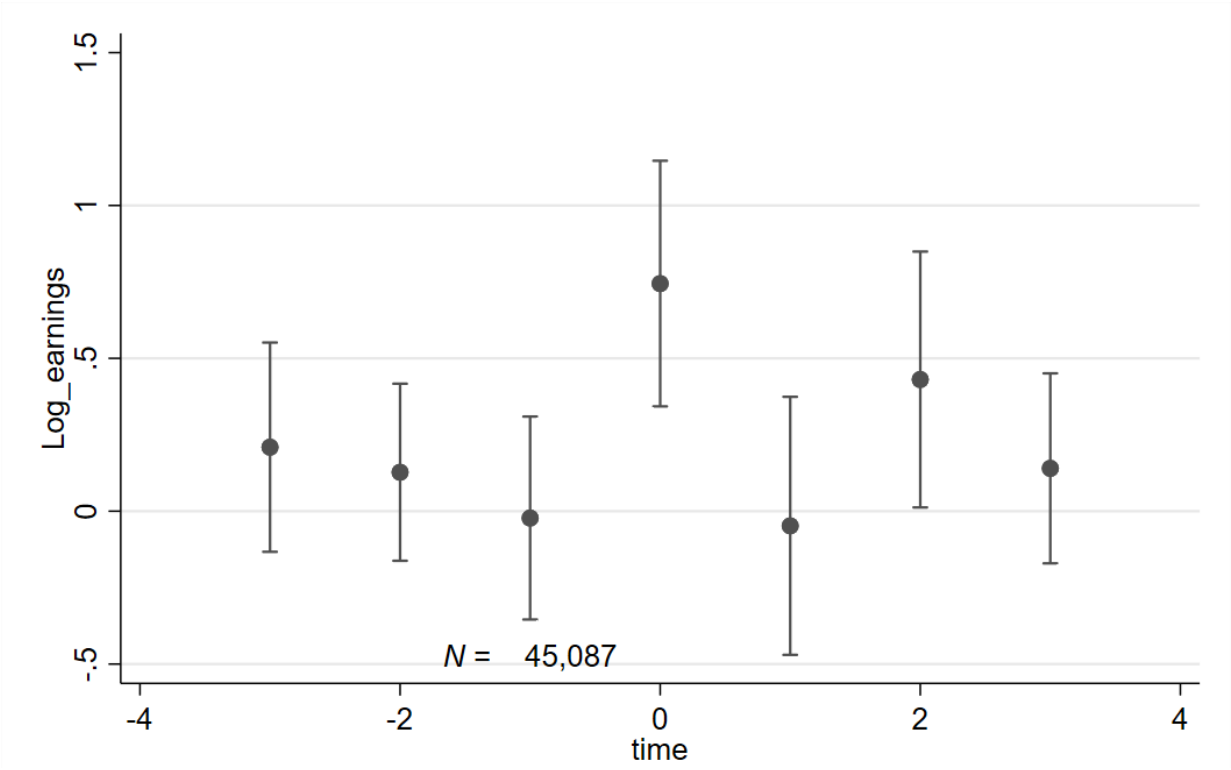
	(1)	(2)	(3)	(4)	(5)	(6)
SEZ	0.775***	0.745***	0.906***	0.775***	0.745***	0.906***
	(0.234)	(0.218)	(0.252)	(0.234)	(0.219)	(0.253)
Logarithm of labor		-0.027***	-0.001		-0.027***	-0.001
		(0.007)	(0.009)		(0.007)	(0.009)
Logarithm of capital			0.490***			0.490***
			(0.015)			(0.015)
Lags	Yes	Yes	Yes	Yes	Yes	Yes
Leads	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Business activity fixed effects	No	No	No	Yes	Yes	Yes
constant	15.251***	15.793***	7.070***	15.251***	15.793***	7.070***
	(0.003)	(0.057)	(0.282)	(0.003)	(0.057)	(0.282)
Number of observations	59,826	45,087	44,662	59,826	45,087	44,662

Notes: Standard errors in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors are clustered at the level of multiplication region and business activity. Dependent variable: logarithm of earnings

To identify the causal effect of SEZ treatment on firm earnings, I use the instrumental variable approach. The results of reduced form and first stage estimation are presented in Table 4 of the Annex. The results indicate that the decisions for SEZ location are not connected with dominant industries and their growth at region or country levels. However, preexisting

industrialization increases SEZ performance (Frick et al., 2018). Nevertheless, according to Frick et al. (2018), the SEZ location decisions could be made on the basis of different factors: proximity to ports, large markets, or the main developed markets of the world, the access to the largest cities in the country, to the ports. Most SEZs in Russia are located near the largest cities of Moscow and Saint-Petersburg, and the main developed markets in Europe and Asia. SEZs in the south of the country are located near Lake Baikal and SEZs in the south-western part are located near the Black Sea and the Caspian Sea. Industrial zones are located mainly in the European part of the country. The logistic zone in Ulyanovsk Oblast, which was established in 2009, is located near the Volga River, the longest in Europe. Thus, instrument variables could be constructed based on the location with the new data. The proximity to these specialization centers should not directly impact firm earnings and total factor productivity. Thus, the exclusion restriction and relevance condition should hold.

Figure 3. Time passage relative to the year of the SEZ treatment.



Notes: In the graph, grey points are the point estimates; lines below and above point estimates are at the 95% confidence interval.

Further analysis of the SEZ effects on the domestic market in Russia could consider the spatial proximity of firms to SEZs, because the SEZ neighboring regions could benefit more from technological spillovers in the same industry. Moreover, the productivity changes after SEZ policy implementation could be studied in formal and informal sectors separately in Russia, as the marginal firm in the informal sector is smaller than in the formal sector (Paula and Scheinkman, 2010). In addition, informal firms do not have access to credit and to legal protection provided by the state, and consequently they cannot increase productivity (Paula and Scheinkman, 2010). Thus, the formal sector could benefit more from SEZ policy in the same sector. However, research could be undertaken with more data.

Newman and Page (2017) emphasize that countries' geographic proximity of firms and formed industrial clusters could be beneficial for firms in terms of transport cost reduction, shared inputs, productivity spillovers, and thus profit growth. Hence, spatial industrial policies, e.g. SEZ policy, could lead to country growth with positive firm performance. My research findings and the results of Frick et al. (2018) on the growth of SEZs in Russia could be a baseline for further analysis of Russian economic growth after SEZ policy implementation.

According to Farole (2010), Zeng (2016), and Frick et al., (2018), the SEZ policy effect on productivity growth, and SEZ growth in general, may depend on the quality of institutions and infrastructure, incentive packages for investors, proximity to ports, large markets, or the main developed markets of the world, access to the largest cities in the country, the business climate of the country, government monitoring and evaluating instruments of SEZ policy, and national one-stop-shops services. The SEZ policy in Russia provides investors with the benefits of a free customs regime, profit tax rate deduction, and exemption from land and transport taxes. The location of SEZs could be attractive for investors: the industrial zones are located near the largest cities of Russia, Moscow and Saint-Petersburg, and large European and Asian markets, while the touristic and recreational zones are located near the borders and the sea or lakes. However, the quality of institutions, infrastructure, and business climate for potential investors in SEZs have not yet been studied. Thus, the government could monitor these factors to increase SEZ performance and productivity growth.

6 Discussion

In 2005, the Russian government created Special Economic Zones (SEZs) to attract foreign investors with tax privileges. Foreign investors can have a significant impact on the productivity of domestic firms, revenues, and their market share through the implementation of new technologies and the creation of new firms. However, to my knowledge, the effects of SEZs on the domestic market in Russia are largely understudied. In this thesis, I study the effects of creating SEZs on productivity and revenue growth in Russia using the generalized Difference-in-Difference (DID) technique. I use panel data from 2006 to 2019, collected from the Federal State Statistics Service of Russia,[22] the Federal Tax Service of Russia,[23] the Russian Special Economic Zones website,[24] and Spark Interfax.[25] The data includes time-varying SEZ treatment on firms, firms' characteristics, and accounting data. The primary outcome variables of interest are revenues and total factor productivity. In the sample, I have 12 regions affected by the SEZ policy and 177 business activities treated by SEZ policy. The variation in time and SEZs of the policy implementation, as well as firms' decisions to enter SEZs, allow me to estimate the causal effects after SEZ policy implementation.

In my analysis, I use an instrument variable approach to identify the causal effect of the Russian SEZ policy on firm earnings and total factor productivity. The idea of the instrument is based on the SEZ location decision, connected with industry dominance at regional and country levels. I construct the instrument with the SEZ industry share in the overall gross regional product in 2000 and the growth rate of the same industry at the country level. The relevance and exclusion restriction should hold for the instrument as industry dominance of the firm at the regional level does not have a direct effect on the total factor productivity of firms and earnings. Moreover, the instrument is constructed on a different period and level of the data (country and region). My research findings reject the hypothesis that the SEZ location decision is based on the dominant industry of the region on the country level. Thus, the endogeneity problem of firm SEZ treatment

[22] Federal State Statistics Service of Russia. Open data. https://rosstat.gov.ru/opendata (accessed December 4, 2020).
[23] Federal Tax Service of Russia. Open data. https://www.nalog.ru/opendata/?n=&od=&by= (accessed December 4, 2020).
[24] Russian Special Economic Zones. http://eng.russez.ru/ (accessed December 1, 2020).
[25] International information group SPARK. https://www.spark-interfax.ru/ (accessed December 4, 2020).

could persist in the analysis. However, for future research, the instrument could be constructed based on the hypothesis of SEZ location proximity to important specialization centers (e.g. proximity to large rivers and transport centers for logistic zones). However, given that proximity to these specialization centers should not directly impact firm earnings and total factor productivity, the exclusion restriction and relevance condition should hold.

SEZ policy is an instrument for attracting FDI on a country and regional level, which is used in China, India, Poland, African countries and other countries. The main SEZ privileges for investors are free customs zone regime, profit tax rate deduction, and exemption from land and transport taxes. By 2020, twenty-seven SEZs had been created in eighteen Russian regions with different specializations: technological (6 zones), touristic and recreational (5 zones), industrial (17 zones), and logistic (1 zone). The touristic and recreational zones are located near the borders and sea or lakes: zones in the south of the country are located near Lake Baikal and zones in the south-western part are located near the Black Sea and the Caspian Sea. Industrial zones are located mainly in the European part of the country. The logistic zone is in Ulyanovsk Oblast located near the Volga River, which is the longest river in Europe.

China implemented SEZ policy in 1978, African countries in the late 1990s, Poland in 1995, and India in 2000. In comparison with other countries (China, India, Poland, African countries, and other countries), the Russian SEZ policy is a recent reform and there is no previous experience similar to SEZs, e.g. in India EPZs were replaced by SEZs because of poor performance and low attraction of investors. A thorough literature review reveals mixed results of SEZ policy effects on productivity growth: positive (Abraham et al., 2010; Ito et al., 2010; Wang, 2013; Alder et al., 2016; Lu et al., 2019; Zhaoying, 2021) negative (Lin et al., 2009), and no effect (Lin et al., 2009). The SEZ policy effect on productivity growth and in general SEZ growth could depend on the quality of institutions and infrastructure, incentive packages for investors, proximity to the ports, large markets, or the main developed markets of the world, access to the largest cities in the country and to the ports, the business climate of the country, government monitoring and evaluating instruments of SEZ policy, and national one-stop-shop services (Farole, 2010; Zeng, 2016; Frick et al., 2018). Moreover, the initial number of SEZs could impact SEZ performance. According to Zeng (2016), Sub-Saharan African countries with 10 or 20 zones, in the beginning, received worse effects for the domestic economy in comparison with SEZs in China that had 4 zones at the beginning. Further, productivity growth after SEZ policy implementation could

depend on the dominant effect: the first effect arises from higher productivity of foreign firms on the domestic market, when domestic firms could benefit from R&D spillovers from foreign firms and productivity growth; the second effect arises from higher competition after entry of foreign firms and revenues of domestic firms decrease.

The research findings of estimating SEZ effects on productivity growth in China, India, Poland could not be applied to the Russian case for several reasons:

- different types of SEZs (studies consider original SEZs and EPZs together but these zones have different directions);
- different outcome variables (FDI, export, wage);
- other conditions of the market or SEZs (e.g. in India EPZs were replaced by SEZs because of poor performance, and in Poland SEZs were established in regions with serious economic problems);
- SEZ experience is longer (e.g. in China SEZs were established in 1978);
- different instigating parties of SEZ policy implementation (e.g. in India SEZs could be initiated by the general public in comparison with Russia, where the government establishes SEZs);
- the privileges for investors are different (e.g. in India tax exemption for residents lasts 5 years and in Russia from 5 to 15 years, depending on the particular SEZ and business activity).

The results of the study in this thesis indicate a positive and significant effect of the Russian SEZ policy on firm revenues. All the coefficients are robust to different specifications when including one or three leads and lags. The labor coefficient is significant and negative, which could occur in the situation in which a firm has enough labor and an additional unit of labor will decrease earnings. The capital coefficient is positive and significant in all specifications because more input should lead to more output and more earnings. The research findings could contribute to the urban economic literature on place-based policies and may be helpful to policymakers in Russia and other countries.

Further research regarding the SEZ effects on the domestic market in Russia could consider formal and informal firms separately, dividing the SEZ effects for both sectors. In addition, given that SEZ neighboring regions could be affected by the SEZ policy, research using spatial analysis could be undertaken, but with more extensive data on Russian firms.

References

ABRAHAM F., KONINGS J., and SLOOTMAEKERS V. FDI Spillovers in the Chinese Manufacturing Sector. *Economics of Transition and Institutional Change* 18, no. 1 (2010): 143–82.

AGGARWAL A. Special Economic Zones: Revisiting the Policy Debate. *Economic and Political Weekly* 41, no. 43/44 (2006): 4533–36.

ALDER S., SHAO L., and ZILIBOTTI F. Economic Reforms and Industrial Policy in a Panel of Chinese Cities. *Journal of Economic Growth* 21, no. 4 (2016): 305–49.

ANGRIST J., and PISCHKE J. Mostly Harmless Econometrics: An Empiricist's Companion. In Mostly Harmless Econometrics: An Empiricist's Companion, 2009.

BRAUTIGAM D., FJELDSTAD O., and MOORE M. Taxation and State-Building in Developing Countries: Capacity and Consent. *Cambridge University Press*, 2008.

CHAUREY R. Location-Based Tax Incentives: Evidence from India. *Journal of Public Economics* 156, no. C (2017): 101–20.

CIESLIK A., and Ryan M. Location Determinants of Japanese Multinationals in Poland: Do Special Economic Zones Really Matter for Investment Decisions? *Journal of Economic Integration 20*, no. 3 (2005): 475-96.

CIZKOWICZ P., CIZKOWICZ-PEKALA M., and RZONCA A. The Effects of Special Economic Zones on Employment and Investment: Spatial Panel Modelling Perspective. NBP Working Papers 208 (July 5, 2015).

DCED Report. Increased productivity creates economic growth – DCED. https://www.enterprise-development.org/what-works-and-why/evidence-framework/increased-productivity-creates-economic-growth/ (accessed June 19, 2021)

DCED Report. Increased Productivity / Revenues Lead to Increased Employment – DCED. https://www.enterprise-development.org/what-works-and-why/evidence-framework/increased-productivity-revenues-employment/ (accessed June 19, 2021)

DOROZYNSKI T., SWIERKOCKI J., and URBANIAK W. Determinants of Investment Attractiveness of Polish Special Economic Zones. *Entrepreneurial Business and Economics Review* 6 (December 1, 2018): 161–80.

DU L., HARRISON A., and JEFFERSON G. Do Institutions Matter for FDI Spillovers? The Implications of [the People's Republic of] China's Special Characteristics.Policy
Research Working Paper 5757, The World Bank, Development Economics Vice

Presidency. 2011.

EBENSTEIN A. Winners and Losers of Multinational Firm Entry into Developing Countries: Evidence from the Special Economic Zones of the People's Republic of China (June 1, 2012). *Asian Development Review*, Volume 29 No. 1.

FAJNZYLBER P., MALONEY W., and MONTES-ROJAS G. Does Formality Improve Micro-Firm Performance? Evidence from the Brazilian SIMPLES Program. *Journal of Development Economics* 94, no. 2 (2011): 262–76.

FAROLE T., BRAUTIGAM D., and TANG X. China's Investment in African Special Economic Zones: Prospects, Challenges, and Opportunities. World Bank - Economic Premise 5 (January 1, 2010): 1–6.

FAROLE T., and MOBERG L. It Worked in China, so Why Not in Africa?: The Political Economy Challenge of Special Economic Zones. WIDER Working Paper Series. *World Institute for Development Economic Research* (UNU-WIDER), 2014.

Federal State Statistics Service of Russia. Open data. https://rosstat.gov.ru/opendata (accessed December 4, 2020).

Federal Tax Service of Russia. Open data. https://www.nalog.ru/opendata/?n=&od=&by= (accessed December 4, 2020).

FRICK S., RODRIGUEZ-POSE A., and WONG M. Toward Economically Dynamic Special Economic Zones in Emerging Countries. *Economic Geography* 95 (May 23, 2018): 1–35.

GEBREWOLDE T. Special Economic Zones Evidence and prerequisites for success. *International Growth Centre*. 2019.

GOLUBKIN I., BUKHAROVA M., DANILOV L., ZVERKOV V., LABUDIN M., and VALEEVA A. Russian Special Economic Zones. Business Navigator. Association for the Development of Clusters and Technology Parks of Russia. 2019.

GRANGER C. Investigating Causal Relation by Econometric and Cross-Sectional Method. *Econometrica*, 37, (1969): 424-438.

GRANT M. Why Special Economic Zones? Using Trade Policy to Discriminate across Importers. *American Economic Review* 110, no. 5 (May 1, 2020): 1540–71.

GREENSTONE M., HORNBECK M., and MORETTI E. Identifying Agglomeration Spillovers: Evidence from Winners and Losers of Large Plant Openings. *Journal of Political Economy* 118, no. 3 (2010): 536–98.

HSIEH C., and KLENOW P. Misallocation and Manufacturing TFP in China and India. The *Quarterly Journal of Economics* 124, no. 4 (2009): 1403–48.

HU A., and JEFFERSON G. FDI Impact and Spillover: Evidence from China's Electronic and Textile Industries. *The World Economy* 25, no. 8 (2002): 1063–76.

HYUN Y., and RAVI S. Place-Based Development: Evidence from Special Economic Zones in India. Boston University - Department of Economics - The Institute for Economic Development Working Papers Series. August 2018.

International information group SPARK. https://www.spark-interfax.ru/ (accessed December 4, 2020).

ITO B., YASHIRO N., XU Z., CHEN X., WAKASUGI R. 2010. How Do Chinese Industries Benefit from FDI Spillovers? RIETI Discussion Paper Series 10-E-026.

JIN Y. Special Economic Zones: A Welfare Analysis of Labor Market Spillover Effect. December 2019.

KLINE P., and MORETTI E. Local Economic Development, Agglomeration Economies, and the Big Push: 100 Years of Evidence from the Tennessee Valley Authority. Working Paper. Working Paper Series. *National Bureau of Economic Research*, August 2013.

LAERENCE D., DIEWERT W, and FOX K. The contributions of productivity, price changes and firm size to profitability. J Prod Anal 26, 1–13 (2006).

LIN P., LIU Z., and ZHANG Y. 2009. Do Chinese Domestic firms Benefit from FDI Inflow? Evidence of Horizontal and Vertical Spillovers. *China Economic Review* 20, 677–691.

LU T., WANG J., and ZHU L. Place-Based Policies, Creation, and Agglomeration Economies: Evidence from China's Economic Zone Program. *American Economic Journal: Economic Policy* 11, no. 3 (August 2019): 325–60.

Map Chart. Russia map. https://mapchart.net/russia.html (accessed June 19, 2021)

MAZIOTIS A., SAAL D., and THANASSOULIS E. Profit, Productivity and Price Performance Changes in the English and Welsh Water and Sewerage Companies. *SSRN Electronic Journal*. (2012).

MOBERG L.The Political Economy of Special Economic Zones: Lessons for the United States, 21 CHAP. L. REV. 407 (2018).

NAZARCZUK J., and UMINSKI S. The Impact of Special Economic Zones on Export Behaviour: Evidence from Polish Firm-Level Data. E a M: *Ekonomie a Management* 21 (September 6, 2018): 4–22.

NEWMAN C., and PAGE J. Industrial Clusters: The Case for Special Economic Zones in Africa. WIDER Working Paper Series. WIDER Working Paper Series. *World Institute for Development Economic Research* (UNU-WIDER), 2017.

PASTUSIAK R., BOLEK M., JASINIAK M., and KELLER J. Effectiveness of Special Economic Zones of Poland. 36 (June 27, 2018): 263–85.

Polish Investment and Trade Agency. https://www.paih.gov.pl/why_poland/investment_incentives/sez} (accessed December 1, 2020).

Russian Special Economic Zones. http://eng.russez.ru/ (accessed December 1, 2020).

PAULA, Á., and SCHEINKMAN, J. Value-Added Taxes, Chain Effects, and Informality. *American Economic Journal*: Macroeconomics 2, no. 4 (October 2010): 195–221.

Special Economic Zones in India. http://www.sezindia.nic.in/ (accessed December 1, 2020).

WANG J. The Economic Impact of Special Economic Zones: Evidence from Chinese Municipalities. *Journal of Development Economics* 101 (March 2013): 133–47.

WARR P. EXPORT PROCESSING ZONES: The Economics of Enclave Manufacturing. *The World Bank Research Observer* 4, no. 1 (January 1, 1989): 65–88.

ZENG D. Building Engines for Growth and Competitiveness in China: Experience with Special Economic Zones and Industrial Clusters. *World Bank Publications*, 2010.

ZENG D. Special Economic Zones: Lessons from the Global Experiance. *PEDL Synthesis Paper Series*. No.1. 2016.

ZHAOYING L. Quantifying the effects of Special Economic Zones using spatial econometric models. Discussion Papers in Economics and Business 21-01, Osaka University, Graduate School of Economics. 2021.

Annex

Table 4. Linear regression with instrument variable.

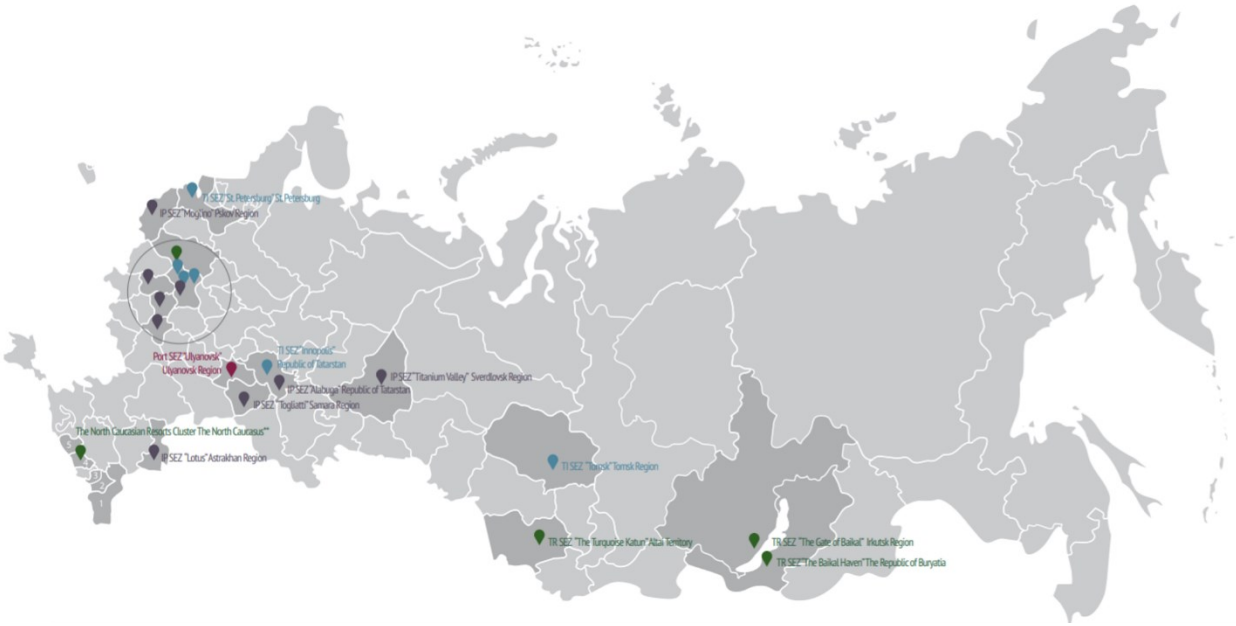
REDUCED FORM	(1)	(2)	(3)	(4)	(5)	(6)
Instrument	-0.002***	-0.002***	-0.003***	-0.002***	-0.002***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Logarithm of labor		-0.045***	-0.026***		-0.045***	-0.026***
		(0.007)	(0.006)		(0.007)	(0.006)
Logarithm of capital			0.346***			0.356***
			(0.012)			(0.012)
constant	16.568***	17.350***	11.473***	16.568***	17.350***	11.473***
	(0.134)	(0.138)	(0.249)	(0.134)	(0.138)	(0.249)
Number of observations	101,100	79,994	77,758	101,100	79,994	77,758
FIRST STAGE	(7)	(8)	(10)	(11)	(12)	(13)
Instrument	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Logarithm of labor		-0.001***	-0.000*		-0.001***	-0.000*
		(0.000)	(0.000)		(0.000)	(0.000)
Logarithm of capital			0.000			0.000
			(0.000)			(0.000)
constant	-0.002	0.008	0.004	-0.002	0.008	0.004
	(0.004)	(0.005)	(0.008)	(0.004)	(0.005)	(0.008)
Number of observations	145,591	114,053	86,742	145,591	114,053	86,742
Lags	No	No	No	No	No	No
Leads	No	No	No	No	No	No
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Business activity fixed effects	No	No	No	Yes	Yes	Yes

Notes: Standard errors in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors are clustered at the level of multiplication region and business activity. Dependent variable: logarithm of earnings

Figure 4. Map of SEZs in Russia with non-zero residents.

Source: Created by author with https://mapchart.net/russia.html

Figure 5. Map of SEZs in Russia with SEZ names.



Notes: Blue indicates technological zones; purple logistic zones; grey industrial zones; green touristic and recreational zones.
Source: Golubkin et al. (2019)